

## DEVICE FOR VENTILATING AND COOLING THE INTERIOR OF A MOTOR VEHICLE

### Specification

The invention relates to a device for ventilating and cooling the interior of a vehicle with air inlet openings located in the rear in a solar cell-equipped vehicle roof and with at least one air guide channel connected to it according to the preamble of claim 1.

Conventionally the interior of a vehicle is reached by blowing the outside air surrounding the vehicle into its interior, the cooling of the heated interior being achieved by the temperature difference between the outside and the inside temperature and the cooling action of the air flow. Devices for this supply and withdrawal of air from the outside to the inside and vice versa are known according to DE 40 22 928 C1 also for the roof area of a motor vehicle. They generally consist of a fan which is located in the region of the roof cutout which can be closed with a conventional sliding roof cover.

DE 39 38 259 C1 discloses a motor vehicle with a folding roof cover in the vehicle, when the roof cover is folded up a fan necessarily being moved into the action position in an opening between the roof cover and a motor vehicle roof opening frame. This fan can be electrically operated with a solar module mounted on the roof side. This arrangement for ventilation of the passenger compartment is likewise used to supply outside air by means of the fan into the interior of the passenger compartment in order to cool the interior of the passenger compartment solely by the supplied outside air. This outside air flow supply can however at most achieve 50% cooling of the interior since the outside air - especially on hot days - contributes to cooling of the heated vehicle space only to a very limited degree due to strong heating.

Especially when using glass rooves which are optionally equipped with solar cells does greater heating of the interior of the passenger compartment occur directly underneath the glass roof, therefore in the top area of the passenger compartment interior. Thus it is desirable to blow outside air predominantly into this upper passenger compartment interior region. DE 42 04 785 A1 discloses an arrangement for climate control of a vehicle interior which in addition has a heat exchanger which extends beyond the entire length of the vehicle roof on the lower inside of the roof, in order to use the outside air blown into a cassette in which the heat exchanger is located to

supply additionally cooled air to the passenger compartment interior. These heat exchangers are limited in their cooling capacity depending on the temperature of the outside air. Moreover, these heat exchangers require cassettes which are located on the roof side and which result in a reduction in the height of the passenger compartment interior. Furthermore, these heat exchangers in combination with cassettes are complex in their construction and costly to produce.

Accordingly the object of this invention is to make available a device for ventilating and cooling the interior of a motor vehicle which even at high outside temperatures allows effective cooling of the vehicle interior, preferably in its upper region, which is simple in its structure and is economical to produce.

This object is achieved according to the features of claim 1.

The core idea of the invention is that in a device for ventilating and cooling the interior of a motor vehicle with air inlet openings located in the rear in a solar cell-equipped vehicle roof and with at least one air guide channel connected to it, this air guide channel is restricted to the rear area of the vehicle roof and on the inside has at least one fan for intaking outside air and at least one cooling element for cooling the intaken air. Structural simplicity is achieved in that the bottom of the air guide channel is formed by a first section of a roof portion which extends in the direction from the vehicle rear to the vehicle front and the top of the air guide channel is formed by a second section of a roof portion which extends in the direction from the vehicle front to the vehicle rear.

Since the air guide channel is restricted to the rear-side area of the vehicle roof and the fan and a cooling element are integrated in this air guide channel, a device for ventilating and cooling is easily obtained which on the one hand does not reduce the height of the passenger compartment interior and on the other causes effective cooling of the passenger compartment interior by means of the cooling element. This cooling element can preferably be supplied with current by solar cells so that even while the vehicle engine is off effective cooling of the interior is possible without unnecessarily burdening the vehicle battery.

The solar cells are mounted in the second section above the air guide channel on the outside of the vehicle roof and thus enable a short electrical connection path between the current-generating solar cells and the current-consuming fan and the current-consuming cooling element.

Preferably an air flow which is produced in the air guide channel runs essentially in the lengthwise direction of the motor vehicle such that via the rear air inlet openings outside air is intaken, this process being supported by suction action in the rear of the moving vehicle, and via air outlet openings which are located on the side of the air guide channel facing the front of the vehicle, are blown into the interior [sic]. On this very short air flow path the air flow touches the cooling element which can be made for example as a Peltier cooling element in order to achieve effective cooling of the air flow. This very simple structure of the device for ventilating and cooling the passenger compartment interior moreover has simplification features of formation of the bottom and top by vehicle roof portions. This obviates the necessity of additional components and walls.

The fan can be made both as an axial and also as a radial fan or any other conceivable type of fan.

In order to obtain an effective air flow for effective cooling of the interior, the air inlet openings, the air outlet openings and the air guide channel can extend beyond the entire width of the vehicle roof. This arrangement moreover acts optically advantageously both on the vehicle exterior and also on the vehicle interior. Moreover this device can also be easily optically and functionally integrated in the rear area of a tiltable roof cover or for additional formation of a spoiler.

Other advantageous embodiments will become apparent from the dependent claims.

Advantages and functionalities can be taken from the following description in conjunction with the drawings.

Figure 1 shows in a schematic side view an extract of a motor vehicle with a device for ventilation and cooling according to one embodiment of the invention,

Figure 2 shows in a schematic side view an extract from Figure 1 in an enlargement with the air flow path illustrated.

Figure 1 shows in a schematic side view an extract of a motor vehicle with a device according to one embodiment of the invention. The vehicle has a windshield 2 towards the front 1 and a rear window 4 towards the back 3 of the vehicle.

A vehicle roof portion 5a which extends from the vehicle front 1 in the direction to the rear 3 of the vehicle can be made tiltable and is overlapped in the rear of the vehicle roof with a

vehicle roof portion 5b which runs proceeding from the rear 3 of the vehicle toward the front 1 of the vehicle.

Solar cells 6 are located above the air guide channel 7 which extends between the air inlet openings 8 located in the rear and air outlet openings 9 turned toward the front 1 of the vehicle. The air flow defined by the air inlet and outlet openings is shown by the arrows 10, 11.

In the overlapping area of the roof portions 5a, 5b there is a first section 12 of the roof portion 5b as the bottom of the air guide channel 7 underneath a second section 13 of the roof portion 5a which moreover forms the top of the air guide channel.

Within the air guide channel 7 there is a cooling element 14 for cooling the air stream 10, 11 which is flowing through and a fan 15 for intaking outside air into the air guide channel.

Figure 2 in a schematic shows a section of the vehicle roof which is shown in Figure 1 enlarged. The air flow 16 shown in this drawing clearly shows that the fan 15 intakes the outside air via the air inlet opening 8 and necessarily routes it past the cooling element 14 by its rotary motion. In this way the air flow is brought reliably and effectively to the desired cooling temperature, depending on to what cooling temperature the cooling element has been set. In this way even climate control of the passenger compartment interior is possible, i.e. reaching an interior temperature which is below the outside temperature.

Reference number list

1	vehicle front
2	windshield
3	vehicle rear
4	rear window
5a,5b	vehicle roof portions
6	solar cells
7	air guide channel
8	air inlet openings
9	air outlet openings
10	outside air
11	air flowing into the passenger compartment interior
12	1st section
13	2nd section
14	cooling element
15	fan
16	air flow